MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

PPS0034 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Business)

11 MARCH 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with **FOUR** questions.
2. Attempt **ALL** four questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. **Formulae** are provided at the back of the question paper.
5. **Statistical table** is provided.

QUESTION 1

a) Let X be the discrete random variable with the following cumulative distribution, $F(X=x)$.

X	1	4	6
$P(X=x)$			
$F(X=x)$	**1/5**	**3/4**	**1**

i) Complete the above probability distribution. (3 marks)

ii) Find the expected value and variance for the random variable X. (6 marks)

b) The continuous random variable Y has the following probability density function:

$$f(y)=\begin{cases} 2-4y & ; \quad 0\leq y<\dfrac{1}{2} \\ 4y-2 & ; \quad \dfrac{1}{2}\leq y\leq 1 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

i) Evaluate $P(Y\leq \frac{2}{3})$. (6 marks)

ii) Find the mean and variance for the random variable Y. (10 marks)

(Total = 25 marks)

QUESTION 2

a) A survey reported that 63% of people **do not** plan to spend more on eating out after they retire. If 16 people are randomly selected, determine the

i) expected number of people who plan to spend more on eating out after they retire. (2 marks)

ii) standard deviation of the individuals who plan to spend more on eating out after they retire. (2 marks)

iii) probability that between 3 and 11 in the sample indicate that they actually **do not** plan to spend more on eating out after they retire. (4 marks)

iv) probability that less than 8 in the sample indicate that they actually plan to spend more on eating out after they retire. (2 marks)

b) A painting company does home interior and exterior painting. The company uses inexperienced painters that do not always do a high-quality job. Therefore, an average of 2.4 defects per 200 square feet of painting will be detected.

i) What is the probability that a 400-square-foot painted section will have exactly 9 blemishes? (3 marks)

ii) What is the probability that a 550-square-foot painted section will have 15 or more blemishes? (3 marks)

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c) A manufacturer makes an atomic digital watch that is radio controlled and is powered by a 3-volt lithium battery expected to last three years. Suppose the life of the battery has a standard deviation of 0.3 years and is normally distributed.
   i) Compute the length-of-life value for which 15% of the watch's batteries last longer. (Leave your answer in 4 decimal places.) (4 marks)
   ii) Find the probability that the watch's battery will last between 2.75 and 3.5 years. (5 marks)

(Total = 25 marks)

QUESTION 3

a) Consider the following data on the prices for the 46-inch size for all the 7 brands of HD television available on the website for a major seller.

   RM2299 RM2599 RM2399 RM2299 RM2099 RM2599 RM2399

   i) List all the possible samples of size six (without replacement) from this population and construct the sampling distribution of the sample mean. Then, find the sampling error for each sample. (Leave your answers in 1 decimal place.) (15 marks)
   ii) If a random sample of 6 prices: 2599, 2399, 2299, 2099, 2599, 2399 was mistakenly recorded as 2599, 2399, 2399, 2099, 2599, 2399, calculate the non-sampling error. (3 marks)

b) When its ovens are functioning properly, the time required to bake apple pies at a bakery shop is normally distributed with a mean of 48 minutes and a standard deviation of 4.9 minutes.
   i) What is the mean, and the standard deviation of the sample mean of a random sample of 56 pies? (3 marks)
   ii) Find the probability that the mean baking time of a sample of 56 pies will be at least 49 minutes. (4 marks)

(Total = 25 marks)

Continued...

QUESTION 4

a) A dairy fresh ice cream manufacturer uses a filling machine for its 64-ounce cartons. There is some variation in the actual amount of ice cream that goes into the carton. The machine can go out of adjustment and put a mean amount either less or more than 64 ounces in the cartons. To monitor the filling process, the production manager selects a simple random sample of 30 filled ice cream cartons each day. The sample data are:

63.6	63.0	64.8	64.4	64.2	63.5
65.5	63.5	64.4	65.7	62.9	63.0
65.1	62.1	63.3	62.4	65.5	64.3
62.9	63.1	65.0	66.3	65.8	63.7
64.0	62.2	65.3	63.4	64.9	65.2

Assume that the population variance is 1.3033 ounces .

Does the company have sufficient evidence, at the $\alpha = 0.20$ level, to conclude that the filling machine is out of adjustment? (10 marks)

b) A mail order business prides itself in its ability to fill customers' orders in six calendar days or less on the average. On one occasion when a sample of 46 customers was selected, the average number of days was 6.76, with a standard deviation of 1.8 days. Can the company conclude that its mail-order business is achieving its goal at a 0.2% significance level? (9 marks)

c) Suppose a random sample of 205 accounts from a corporate credit card database revealed a sample average balance of RM6325 with a standard deviation of RM438. Construct a 98% confidence interval for the true population of all credit card balances for this corporate credit card. (6 marks)

(Total = 25 marks)

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Formulae:

1.

	Mean	**Variance**
Discrete Random Variable X	$\mu = E(X) = \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X) = \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	**Mean**	**Standard Deviation**
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \dfrac{e^{-\lambda}\lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x: $z = \dfrac{x-\mu}{\sigma}$

4. The z value for a value of $\bar{x}$: $z = \dfrac{\bar{x}-\mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

5. Sampling error = $\bar{x} - \mu$

Non-sampling error = incorrect $\bar{x}$ − correct $\bar{x}$

6. Point estimate of $\mu = \bar{x}$

Margin of error = $\pm 1.96\sigma_{\bar{x}} = \pm 1.96\dfrac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96\dfrac{s}{\sqrt{n}}$

7. The $(1-\alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

$\bar{x} \pm zs_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \dfrac{s}{\sqrt{n}}$

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